



Ø BEAT



COLO. SPRINGS,
COLORADO

MAY 1981

QRM-less Tuning — Part 2

POWERLESS TUNING OF ANTENNA SYSTEMS

In Part Two, we are going to look closely at the "media" which takes your transmit/receive "power" between the antenna and the shack. It is bi-directional, as you know. It has been demonstrated that many antennas, when correctly tuned, perform with an increased efficiency of 10 dB or more in receive and transmit signal strength, compared to the normal tuning method of using a VSWR bridge. The antenna is basically a resonant circuit. For maximum performance it must be tuned to resonance for the same reason you tune the transmitter output stages for resonance. Maximum efficiency will occur if: (1) Use of half-wavelength coax, or multiple of half-wavelengths. (2) The antenna (array) is resonant at the desired frequency. (3) The matching network is adjusted for 50-ohm impedance. If the above factors are all optimum, minimum VSWR will be realized, and at the same time maximum efficiency will be demonstrated. A properly operating system can have its transmission line changed without affecting the VSWR reading. A good "gimmick" is to fabricate a $\frac{1}{4}$ wavelength coax "patch" cable for insertion and/or removal from the system. This will represent a "worst case" change from your intended configuration. The patch will tell you the truth... but only on the band for which it was fabricated.

For multiband antennas, the coax length should be chosen for a multiple of $\frac{1}{2}$ wavelength of all bands for that antenna, and it should be carefully trimmed (even if too long) for those bands.

The coax itself is the equivalent of a series resonant circuit. When the coax and the antenna are connected, if the line length is proper, the antenna feedpoint is virtually coincident to the transmitter end of the coax!

Maximum current flows in a "short circuit", and this means "what goes in — comes out". Case in point, the VSWR bridge has the basic limitation that it cannot differentiate between resistive and reactive components. Most users, not realizing this limitation, operate their antennas at the frequency of lowest VSWR, not necessarily the same as the most effectiveness.

An electrical half wavelength of coax will be physically less than 400 ft. — frequency (MHz) and more than 250 feet — frequency (MHz). Example: for 28 MHz, the coax length will be less than $400 - 28 = 14.3$ feet, and more than $250 - 28 = 9$ feet. If the velocity factor is accurately known, the length of co-ax will be $492 \text{ feet} \times \text{velocity factor} - \text{frequency (MHz)}$. Coax normally has a velocity factor of more than 0.5 and less than 0.8. When using "frequency-sensitive voltmeters" (i.e., a receiver) that cover narrow ranges, the length of coax should initially be cut to a length greater than needed, followed by experimental cutting to the correct length. Try this: (1) Set the noise bridge to 0 ohms. (2) Connect the coax to the ANT connector and the receiver (FSVM) to the RCVR connector on the Bridge. (3) Short-circuit the coax at the far end. (4) Tune the receiver for a null in the noise. The frequency of the null will indicate the electrical length of the coax as a multiple of some half-wavelength at the tuned frequency. (5) For fixed frequency receivers, cut the coax cable a small amount at a time until the noise null occurs. Short the coax each time it is cut off. (A sewing needle, piercing the coax works fast... when you reach null, mark the point for cut-off and installation of your style of connector.) NOTE: Same procedure is used for the determination of one-quarter wavelength of coax, except the coax is open at the far end. NOTE: Best null may occur at a dial setting slightly above zero, due to losses.

(continued on page 5)

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(* Two-year board terms began October 1980)

ZERO BEAT is published monthly in the interest of the members of the Pikes Peak Radio Amateur Association, Inc., Colorado Springs, Colorado. Permission is given to reprint articles or excerpts provided credit is given. Deadline for submission of articles is the 21st of the month. Classifieds accepted anytime.

The Pikes Peak Radio Amateur Association meets on the second Wednesday of each month at Sabin Jr. High School, 3605 N. Carefree Circle at 7:30 p.m. and all amateurs and interested parties are invited to attend.

Editor: Don Lohse KBØKQ, 1410 E. LaSalle, Colorado Springs, CO 80907 635-7469

PIKES PEAK RADIO AMATEUR ASSOC. MINUTES APRIL 1981

The April meeting of the Pikes Peak Radio Amateur Association was called to order at 7:41 P.M., April 8, 1981 by club President, Dave Vierling, NØDV, at Sabin Jr. High. The 38 members and guests introduced themselves and briefly told about their current interests in amateur radio.

The program was, thanks to Bob Poirier, KØDJ, on traffic handling and traffic nets. This is a very pertinent subject for all of us, as it is the original basis for the ARRL. More information can be had from the ARRL for a S.A.S.E. Furthermore, you may want to listen to the Colorado-Wyoming net (C.W.N.) at 7:30 P.M. local on 3.715 MHz. Anyway, thanks for filling us in, Bob!

Oak Stockton (KØROL) gave a report on current Colorado Council of Amateur Radio Clubs (CCARC) activities and gave some reasons why the PPRAA should maintain its membership status in the CCARC. The ensuing discussion involved questions, comments and concerns by the membership. No decisions were reached, and the problem was addressed to the Board. The March minutes were approved as published in ZERO BEAT. Last month's board meeting minutes (which were missing from ZERO BEAT last month) were read and approved.

A letter of thanks from the Sweet Adelines was passed around for the members to read. Sweet Adelines — you are welcome and thank YOU for giving us the opportunity to be of service!

It was announced that information about the club's participation in the Black Forest "Outhouse Race" is still pending.

Dave Vierling announced that a special board meeting was held to discuss the possibility of a club station at the Olympic Training Center. the rundown on that is as follows:

An official from the O.T.C. called Frank Freiler (WBØPAJ) and asked if the club was still interested in a station at the O.T.C. We were, and an impromptu meeting was held between club members and O.T.C. officials. Subsequent to that, a special board meeting was held for the purpose of drafting an official proposal. Don, (KBØKQ), gathered everyone's notes and wrote up the proposal. A second meeting was

held between club officers and the O.T.C. officials to present the proposal. We are now in a state of waiting — hopefully, hopefully . . .!

Ken (KAØDST), announced that we were still in need of trucks and warm bodies to move tables to and from the Swapfest site.

Ken also announced that the Peterson Mars Station will be on the air any day now from the old control tower.

Bob, (KØDJ), announced that the NOAA Weather Bulletin Station will be on line very soon. The frequency will be 162.475 MHz.

In conclusion, an editorial comment from your Secretary: To all the people (members and non-members) who gave their time and effort to make the Swapfest the success that it was; again, My Hearty Thanks!

73's,
Bill, KFØW

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Earle-KAØDTM Bob-WØWLN George-KØBWH
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BACKYARD DISHES

If the Communications Satellite Corp. has its way, the slogan for the 80s will be not "a chicken in every pot" but "a dish on every roof." Comsat hopes to sell the small, low-cost antennas for installation in individual homes. The company even interested Sears, Roebuck in a joint venture to offer rooftop dishes for \$200 to \$300. Although Sears has since reconsidered, Comsat has not abandoned the idea.

In the meantime, a handful of individuals — mostly southern and western farmers and ranchers who live in areas that are too isolated for TV signals or cable — have already installed dishes in their backyards.

Home "earth stations" theoretically allow the user to tune in the hundreds of programs relayed by geostationary communications satellites hovering over the Equator. The satellite carries four superstations and several pay-TV, sports and all-news networks, plus religious, educational and ethnic programming. The fact that backyard dish owners can pull in signals without paying a subscription fee raises ethical and legal questions that will take time to be resolved.

Although most of the less-expensive earth installations are aimed at only one satellite, deluxe models can be maneuvered to receive from other satellites as well, such as those carrying unedited network news feeds designed solely for the eyes of local broadcast stations or entertainment shows relayed to local stations days before official airing.

Even ready cash won't assure a functional dish. The current communications satellites send out weak signals that travel in straight lines. This means dishes must have a clear line of sight to the hovering spacecraft. Since the satellites are over the Equator, all antennas in the U.S. must face south, and the farther north the dish, the closer to the horizon it must be aimed. There can be no obstructions in the vicinity; buildings, etc. Microwave transmissions anywhere near in the area will also render a dish useless.

Nonetheless, the idea of direct satellite broadcasting to the home has captivated the imagination of many. By the end of this decade, earth communication satellites will be more plentiful and more powerful, making practical the use of still smaller, less-expensive dishes, with perhaps more tolerance for interference.

If the political and legal hurdles are cleared — no simple matter, since copyright as well as privacy issues must be resolved, dish technology could indeed be a major step in the process of making the world an extended village.

From Science Digest

Frank, WBØPAJ

FOR SALE: Swan 350 trans., Heathkit Cantenna and SWR meter, 80M dipole w/coax. Chuck Ladge 596-3880

FOR SALE: Drake TR-3 AC3 P.S. \$339.95 WBOHZG 392-8116

FOR SALE: Hallicrafter 6X 110 receiver in excellent condition, 5—32 MHz good general coverage, SWR, ham receiver, Night T60 X-mtr 60 W XTAL controlled 10—80M. Needs 12 DQ5 final, AMECO code osc. and record. Heathkit tour and misc. equipment, manuals on all gear, \$75 for the works. Melvin E. Walters 632-6082

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APRIL BOARD MINUTES

The board was called to order at 8:30 P.M. Those present were Dave, NØDV; Don, KBØKQ; Biz, WDØHCO; Ray, AAØL; Bill, KFØW; Doug, WBØMHP; and Charleen, WBOYOB.

The club and its status with Colorado Council of Amateur Radio Clubs was discussed at great length. The final decision was to write a letter to CCARC giving them the club's concerns and some suggestions for improvement. If no change takes place during the next year, the PPRAA will most likely discontinue membership in CCARC.

The May meeting will be the last meeting at Sabin Junior high School unless we change our meetings to Tuesday or Thursday evening for the summer. The Board is trying to find a new meeting place to retain Wednesday meeting night.

Doug reported that we made \$591.75 from the Swap Fest, plus \$58.95 from the bake sale and \$68.00 from the sale of 17 CCARC Call Books. Thank you notes will be sent to key people and a special thanks to those loyal club members who gave of physical labor and time to make the Swap Fest a success.

Our very efficient and effective publicity chairman, Biz, WDØHCO, is leaving April 21 for the Marshall Islands to become a radar technician there. Biz we will miss you during your year to eighteen month stay there.

The following upcoming events will need your help: Black Forest Outhouse Race, May 9; Walk for Mankind, May 16; Spring Spree, June 20—21; and Field Day June 26—28.

Interested club members are invited to attend a combination antenna building (dipoles for club use) session and Bar-B-Q at Jim & Charleen Colvin's on May



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17. Bring your own meat, one dish (salad, vegetable or dessert) and own beverage.

The next board meeting will be at 7:30 P.M. on May 18 at the home of Doug, WBØMHP, at 3817 Vaquero Circle South.

Respectfully submitted,
Charleen WBOYOB

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WELCOME

We would like to welcome a new advertiser to the pages of Zero Beat. Electronic Bits 'n Pieces, Inc. is a parts house in Aurora that stocks many and varied parts. There are a lot of complaints about the lack of places to get parts, so a new business in that area is welcome. Next time you're up that way, stop in and say hello, and check out the goodies. Support our Zero Beat advertisers!!

UPCOMING PPRAA PUBLIC SERVICE

OUTHOUSE RACE MAY 9

WALK FOR MANKIND MAY 16

SPRINGSPREE JUNE 20 and 21

OTHER HAPPENINGS

FIELD DAY JUNE 27 and 28

No QRM Tuneup (cont.)

The Antenna Noise Bridge is also useful as a signal source for gain-tracking receivers. The noise output is used with nothing connected to the antenna terminal. You can use it to determine the resonant frequency of tuned circuits by connecting the L/C components in series and connecting them across the ANT terminals. Set the Bridge dial for zero and search out the resonant frequency by tuning the frequency sensitive voltmeter (receiver) for a noise null. Remember, only if the antenna has a true 50-ohm radiation resistance will both the Antenna Noise Bridge and a VSWR meter indicate the actual resonant frequency and minimum VSWR at the same frequency. This is due to the fact that a VSWR meter cannot distinguish between resistive and reactive (L/C) components. Regardless of the antenna (or cable) radiation resistance, the bridge will null only at the resonant frequency. NOTE: Connect a non-reactive dummy load across the ANT terminals of the bridge, and adjust for best null. You will find that this procedure is not frequency-dependent, thus proving its capability at all frequencies within its design range.

I have owned the Omega-t Model TE7-02 Antenna Noise Bridge for nearly 10 years, and have used it's 300 MHz range from 7 MHz through 220 MHz with pleasure!

Oak, KØROL

DE—

Well folks, the Annual PRAA Swap Fest has come and gone again and I would like to pat everyone on the back for their hard work and effort. Even though the date usually conflicts somewhat with Easter & I.R.S., the turnout was very gratifying and the profit was also. I know that PPFMA was and is also hurting for capital so I'm glad that they were able to run a profitable concession at the same time. Well done all.

Now that I've got you pumped up, just one discouraging note — an old saw — lack of people to volunteer their services to help out with all the small details and things that need doing. Wish you would just take a little time to offer your assistance. Swapfest and other events painfully show that a very small percentage are always the ones who are the doers. Things like cleaning up, talk in, bake sale and even microphone duty fall on the shoulders of just a few and you know they would like to walk around and check out the gear or just relax too. Our club is only as active and alive as the people who do the job. Please help out!

Many of us hams have never seen a message form, let alone passed traffic on the air so we were very happy to have Bob, KØDJ give us the interesting primer on how and where to get it done. With our fingers crossed for a club station at the O.T.C., the information came at an opportune time. Part of our selling job to the Center was the ability to pass traffic. So give a try — send a message for Mother's Day.

We have just learned that Biz, our able P.R. man, has accepted a job offer that will take him to some remote radar post in the Pacific. (Rare DX?) Needless to say, he leaves some big shoes to fill. If you can take over from Biz and keep the wheels turning we need you.

Another request — if you know of a place suitable for PPRAA meetings we need your input. I'm sure you are

aware of the shortcomings of Sabin and have other ideas. Let us know.

This month's meetings should be very helpful. We are going to take time on the regular meeting night to design and understand how to build a basic multi-dipole antenna system with balun and feedline. Then on May 17th we'll all do the Colvins for an antenna building party and picnic. Plan on an enjoyable afternoon and bring the family!

Some last minute notes for your consideration: Walk for Mankind — KØTER needs your help. Outhouse Race — Dave NØDV Immediately! Field Day — Use permit approved and applied for, Rampart Range Road as before. Mike, KØTER is coordinator and needs more volunteers.

See you all at the next meeting on May 13th.

73,
Dave

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MEETING NOTICE

The May meeting of the Pikes Peak Radio Amateur Association will be held on May 13 at 7:30 p.m. at Sabin Jr. High. This will be our last meeting at Sabin for the summer, they aren't open during the summer, so come to the meeting to find out what will happen about meeting places. The program will be on construction of dipole antennas the right way, and will be conducted by Smitty, WBØLTV. All members and interested parties are invited to attend.

ADVERTISING NOTICE

Zero Beat will gladly run any classified ad submitted to it. However, classifieds will run for **one month only**, unless the advertiser notifies Zero Beat to continue the ad. If more than one item is listed, please keep us informed as to what sold, so that the ads are accurate. Commercial advertisers are welcome to change or update their ads whenever necessary. The ads in Zero Beat are useful to our readers, let's keep them up to date and accurate.



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